STEAM IRONING APPARATUS

DESCRIPTION

The present patent application refers to a steam ironing apparatus for steam-assisted ironing of garments and clothing items, which comprises a steam generator arranged in connection with a smoothing iron, or flatiron, provided with control means for selectively triggering steam emissions from a front steam-ejection nozzle.

Steam-assisted clothing ironing apparatuses of the currently known kinds are generally known to comprise a steam generator, or boiler, which is adapted to produce steam and supply it to the heated plate of a smoothing iron. The lower or bottom surface of such a plate is provided with a plurality of perforations, from which the steam is capable of being emitted towards the clothing item to be ironed, thereby improving the ironing result. There may be furthermore provided a temporary emission of a jet of steam under pressure through one or more apertures arranged in the front portion of the smoothing iron itself; the emission of the steam jet is triggered by the user with the aid of control means that are generally provided on the handle of the smoothing iron itself.

The European patent application no. 0 999 303 refers to a steam

smoothing iron of a professional type comprising first and second steam-ejection apertures arranged on the lower surface of the plate and in the front portion of the iron, respectively. These apertures are connected internally, via corresponding first and second conduits, with a steam-inflow control valve that is housed in the plate and is adapted to be actuated from the outside.

The European patent application no. 1 178 147 refers again to a steam ironing apparatus comprising a stationary steam generator and a flatiron which is connected to said steam generator via a flexible conduit and is equipped with a heated plate provided with a plurality of steam-ejection perforations subdivided into two separate chambers, in which these chambers are arranged frontally and centrally with respect to the flatiron, respectively. Between the steam generator and the perforations of the central chamber there is provided, in the direction of flow of the steam, a steam-flow reducing/shut-off device that is capable of being switched into any of a first control setting, in which steam is conveyed at its maximum flow rate towards the perforations of the central chamber, and a second control setting in which said steam flow rate is reduced. In both such switching positions, anyway, the flow rate of the steam flowing to the perforations of the front chamber remains constant and unaltered.

A typical drawback that is found in the above described prior-art apparatuses lies in the fact that the degree of moisture of the steam being ejected from the front portion of the smoothing iron does not differ from the degree of moisture of the steam that is on the contrary ejected from the central perforations of the plate; the steam jet being ejected from the front portion of the smoothing iron is useful in assisting ironing of clothing portions that are particularly difficult to reach with the plate of the flatiron and/or may exhibit such creases, sewing seams, pleats, and the like, as to require a particularly intense ironing action. For such an ironing action to be capable of being achieved, the degree of moisture of the steam being ejected from the front portion of the flatiron should

actually be sensibly higher than the degree of moisture of the steam flowing out from the central perforations of the iron plate, in order to be able to soften the fibres to a suitably greater extent in view of boosting the ironing effect.

Another drawback that is generally found in prior-art apparatuses is connected with the presence, within the smoothing iron, of small pumps adapted to be actuated manually with the aid of a control push-button so as to cause a spurt of water or steam under pressure to flow towards a spray nozzle arranged on the front side of the flatiron; these pumps, and therefore the various component parts thereof, must necessarily be of an extremely small size in order to be able to be conveniently housed within the flatiron. As a result, they are particularly expensive and subject to possible breakdowns owing to said small size of their component parts.

It is therefore a main object of the present invention to do away with the afore described drawbacks of prior-art solutions by providing a steam ironing apparatus which enables the degree of moisture of the steam being ejected to be duly differentiated between the front portion of the flatiron and the lower surface of the plate of the same iron.

Within the main object as set forth above, it is a purpose of the present invention to provide a steam ironing apparatus which is simpler in its construction and more reliable in its operation.

Another purpose of the present invention is to provide an apparatus of the above indicated kind, which is low in costs and is further capable of being manufactured with the use of readily available, generally known materials, machinery and techniques.

According to the present invention, these aims, along with further advantageous features that will become apparent in the following description, are reached in a steam ironing apparatus incorporating the

characteristics as recited in the appended claim 1.

Anyway, features and advantages of the present invention may be more readily understood from the description that is given below of some preferred, although not sole embodiments that are illustrated by way of non-limiting example with reference to the accompanying drawings, in which:

- Figure 1 is a partially cross-sectional side view of the apparatus according to the present invention;

- Figure 2 is a partially cross-sectional side view of a second embodiment of the apparatus according to the present invention;

- Figure 3 is a partially cross-sectional side view of a third embodiment of the apparatus according to the present invention, in a first operating position thereof;

- Figure 4 is a view of the embodiment illustrated in Figure 3, in a second operating position thereof;

- Figure 5 is a side, partially cross-sectional view along the section line V-V of a fourth embodiment of the apparatus according to the present invention, in a first operating position thereof;

- Figure 6 is a view of the embodiment illustrated in Figure 5, in a second operating position thereof;

- Figure 7 is a side, partially cross-sectional view along the section line VII-VII of the embodiment illustrated in Figure 5, in a third operating position thereof;

- Figure 8 is a view of the embodiment illustrated in Figure 5, in a

fourth operating position thereof;

- Figure 9 is a plan, partially cross-sectional view along the section line IX-IX of the embodiment illustrated in Figure 5.

With reference to the above cited Figures, the steam ironing apparatus according to the present invention comprises a smoothing iron 1 provided with a handle 2, a body 3 and, on the bottom side, a plate 4 whose lower surface 5 is provided with a plurality of steam-ejection perforations 6. Within said plate 4 there is embedded a heating element 7, such as for instance an electric heating element powered from the power mains via the power-supply cable 8.

To complete the steam ironing apparatus according to the present invention there is furthermore provided a steam generator 9 that is adapted to supply steam to the smoothing iron 1 via a first conduit 10 and a second conduit 11; the steam supply through said first and said second conduits 10, 11 is controlled by first and second valve means 12, 13, respectively, such as for instance electromagnetic valves actuated, via the electric circuits 14, 15, by first control means 16 and second control means 17, respectively, which are arranged externally on the smoothing iron 1, preferably in correspondence of the handle 2 thereof.

Within the plate 4 there may be provided means adapted to produce dry steam; such means may for instance be constituted by a vaporization chamber 20 communicating with the first conduit 10 and arranged adjacent to the heating element 7. The dry steam generated in this chamber 20 is obtained by heating up steam to the optimum ironing temperature and the resulting vaporization of possible water particles that may have condensed along the flowpath of the steam in the first conduit 10.

The emission of steam V_1 through the perforations 6 generally occurs

in a continuous manner and is actuated with the aid of the first control means 16 controlling said first valve means 12.

The second steam conduit 11 is in communication with an ejection nozzle 18 provided in the front portion of the smoothing iron 1 so as to generate a spurt-like ejection of steam V_2 with the aid of said second control means 17 controlling said second valve means 13.

The steam ironing apparatus according to the present invention further comprises containment means 21 adapted to hold a liquid L, such as for instance water, said containment means being in communication with said second conduit 11 via a third conduit 22; the connection of said second conduit 11 with said third conduit 22 is preferably situated close to the nozzle 18. The transfer of the liquid L from the containment means 21 along the third conduit 22 up to the connection thereof with said second conduit 11 is obtained, according to a preferred embodiment, owing to the Venturi effect that is brought about by the pressure drop caused by the passage of steam through the second conduit 11.

In an advantageous manner, said containment means 21 may be comprised of a reservoir housed inside the body 3 of the smoothing iron 1, so as this occurs in the embodiment that is illustrated in Figure 1, or they may be arranged somewhere outside the smoothing iron 1 itself.

The operation of the apparatus is as follows: in order to obtain a spurt of humidified steam V_2 ejected from the nozzle 18, all it takes is to just actuate the second control means 17 temporarily, so that the second valve means 13 are caused to switch over from a first operating shut-off condition, in which the flow of steam along the second conduit 11 is prevented, to a second operating open-valve condition, in which the steam is enabled to flow along said second conduit 11 and reach the nozzle 18: in this second operating condition of said valve means, the liquid L, as drawn from said containment means 21 through the third conduit 22

owing to the action of the pressure drop that is brought about by the passage of steam along the second conduit 11, mixes up with the steam in the zone where the third conduit 22 connects with the second conduit 11, thereby creating a water-steam mixture, which may also be referred to as humidified steam, being ejected from the nozzle 18.

The flow of steam V_1 being ejected through the perforations 6, as controlled with the aid of the first valve means 12 which have likewise a first operating shut-off setting and a second operating open-valve setting that can be selected through the first control means 16, is on the contrary comprised of dry steam owing to the passage thereof through the afore mentioned vaporization chamber 20.

It can therefore be readily appreciated how the steam ironing apparatus according to the present invention is actually capable of reaching the afore indicated aims and ensuring all of the advantages deriving therefrom: in fact, a generation of steam is obtained, which, when emitted from the smoothing iron 1, actually has a degree of moisture that is differentiated between the flow of steam V_1 ejected through the perforations 6 and the spurt of steam V_2 ejected through the nozzle 18.

In addition, the pressure drop that is brought about by the steam flowing through the second conduit 11 so as to be able to draw out the liquid L from the containment means 21, enables the pump to be omitted which is usually employed in the traditional prior-art apparatuses to ensure the same task. The smoothing iron is therefore simplified to a considerable extent in its construction under a correspondingly significant reduction in costs. An improved reliability is at the same time obtained thanks to the absence of a number of small-size component parts that are potentially subject to failure and breakdown.

It will be readily appreciated that the invention that has been described above by mere way of example is open to a number of different

applications and may be the subject of a number of modifications and different embodiments without departing from the scope of the same innovatory concept.

So, for instance, Figure 2 can be noticed to illustrate a second embodiment of the present invention which is substantially similar to the previously described one, wherein a length 111a of the second steam conduit 111 upstream of the site at which it connects with the third conduit 122, passes through the interior of the vaporization chamber 120 via an inlet aperture 123 and an outlet aperture 124 that are suitably sealed with the aid of appropriate sealing means 125, 126, 127, 128. In this way, also the steam flowing through the second conduit 111 is heated to the optimum ironing temperature before leaving the iron through the nozzle 118.

Figures 3 and 4 illustrate a third embodiment of the steam ironing apparatus according to the present invention, which comprises a smoothing iron 201 provided with a handle 202, a body 203 and, on the bottom side, a plate 204 whose lower surface 205 is provided with a plurality of steam-ejection perforations 206. Within said plate 204 there is embedded at least a heating element 207, such as for instance an electric heating element powered from the power mains via the power-supply cable 208. There is further provided a vaporization chamber 220 for producing dry steam through heating and the resulting vaporization of possible water particles that may have formed by the condensation of the steam flowing in from the steam generator (not shown) through a first steam-inlet conduit 210. The flow of steam from the steam generator to the smoothing iron 201 is triggered with the aid of first control means 216 provided somewhere on the outside of the smoothing iron 201 itself, preferably on the handle 202 thereof.

Said vaporization chamber 220 is communicating, via a first aperture 213 and distribution means 230 comprising a manifold 231 and a

distribution chamber 232, with both a nozzle 218, located on the front side of the smoothing iron 201, and the perforations 206 through the interposition of valve means 228. These valve means are advantageously comprised of a two-way valve 228 housed in said distribution chamber 232 located adjacent to the manifold 231. Said distribution chamber 232 is communicating with both a second conduit 211, which therefore connects the same chamber 232 with the outlet of the nozzle 218, and a second aperture 212 which is in turn communicating with the perforations 206.

The two-way valve 228 is capable of being actuated with the aid of second control means 217, such as for instance a push-button actuating an electromagnetic valve by means of an electric pulse; these second control means 217 are located somewhere on the outside of the smoothing iron 201, preferably on the handle 202 thereof. Accordingly, the two-way valve 228 has a first operating setting, illustrated in Figure 3, in which the steam is delivered to the perforations 206 through the distribution chamber 232 and the second aperture 212, and a second operating setting, illustrated in Figure 4, in which the steam is delivered to the nozzle 218 through the distribution chamber 232 and the second conduit 211.

The steam ironing apparatus according to the present invention further comprises containment means 221 adapted to hold a liquid L, such as for instance water, said containment means being connected with said second conduit 211 via a third conduit 222. The transfer of the liquid L from the containment means 221 along the third conduit 222 up to the connection thereof with said second conduit 211 is obtained, according to a preferred embodiment, by virtue of the Venturi effect that is brought about by the pressure drop caused by the passage of steam through the same second conduit 211.

In an advantageous manner, said containment means 221 may be

comprised of a reservoir housed inside the body 203 of the smoothing iron 201, so as this is the case in the embodiment illustrated in Figures 3 and 4, or they may be arranged somewhere outside the smoothing iron 201 itself.

The operation is as follows: when the two-way valve 228 is in its first operating condition (Figure 3), the steam, whose flow is controlled by the first control means 216, flows in a continuous manner from the steam generator to the vaporization chamber 220 via the first conduit 210; the dry steam V_1 produced in said chamber 220 is conveyed, through the first aperture 213, along the manifold 231 up to the distribution chamber 232 and from this chamber, through the second aperture 212, to the perforations 206 to be eventually ejected towards the surface of the fabrics or clothing item being ironed.

In order to obtain a spurt of humidified steam V_2 ejected from the nozzle 218, all it takes is to just actuate the second control means 217, so as to temporarily switch over the two-way valve 228 into the second operating setting (Figure 4) thereof: in this way, the two-way valve 228 is caused to convey the flow of dry steam from the distribution chamber 232 to the nozzle 218 through the second conduit 211; at the site where said second conduit 211 connects with the third conduit 222, the steam mixes up with the liquid L, which is sucked in by the pressure drop brought about by the passage of the same steam through the second conduit 211, thereby creating a water-steam mixture, which may also be referred to as humidified steam, being ejected from the nozzle 218.

It should be noticed how, in this third embodiment of the present invention, the entire flow of the steam flowing in from the steam generator is diverted towards either the perforations 206 or the nozzle 218, depending on the setting of the valve 228.

Figures 5 through to 9 illustrate a fourth embodiment of the steam

ironing apparatus according to the present invention, which comprises a smoothing iron 301 provided with a handle 302, a body 303 and, on the bottom side, a plate 304 whose lower surface 305 is provided with a plurality of steam-ejection perforations 306. In a similar manner as in the afore described embodiments, within said plate 304 there is embedded at least a heating element (not shown), such as for instance an electric heating element. There is further provided a vaporization chamber 320 for producing dry steam through heating and the resulting vaporization of possible water particles that may have formed by the condensation of the steam flowing in from the steam generator (not shown) through a first steam-inlet conduit 310.

Said vaporization chamber 320 is communicating, via a first aperture 313 and distribution means 330 comprising a manifold 331 and a distribution chamber 332, with both a nozzle 318, located on the front side of the smoothing iron 301, and the perforations 306 through the interposition of respective valve means 328, 329. These valve means are advantageously comprised of a first and a second valve 328, 329 housed in said distribution chamber 332 located adjacent to the manifold 331. Said distribution chamber 332 is provided with a second conduit 311, which actually connects the same chamber 332 with the outlet of the nozzle 318, and a second aperture 312 which is in turn communicating with the perforations 306.

The above mentioned valves 328, 329 are capable of being actuated with the aid of respective first and second control means 316, 317, such as for instance a pair of push-buttons located somewhere on the outside of the smoothing iron 301, preferably on the handle 302 thereof.

Accordingly, the first valve 328 has a first operating shut-off setting, illustrated in Figure 7, in which the flow of steam towards the perforations 306 is totally prevented, and a second operating open-valve setting, illustrated in Figure 8, into which the valve can be switched by the

actuation of the push-button 330, and in which steam is allowed to flow from the manifold 331 towards the distribution chamber 332 and, from this chamber, towards the perforations 306 via the aperture 312 for being ejected therethrough.

Likewise, also the second valve 329 has a first operating shut-off setting, illustrated in Figure 5, in which the flow of steam towards the nozzle 318 is totally prevented, and a second operating open-valve setting, illustrated in Figure 6, into which the valve can be switched by the actuation of the push-button 331, and in which steam is allowed to flow from the manifold 331 towards the distribution chamber 332 and, from this chamber, towards the nozzle 318 via the second conduit 311 for being ejected therethrough.

In an advantageous manner, to said first and second control means 316, 317 there are associated respective actuator means 314, 315 to turn on and off the flow of steam supplying the smoothing iron 301 from the steam generator (not shown); these actuator means 314, 315 may be comprised of respective links or plates 323, 324 adapted to preferably act on a common micro-switch 325, or two respective micro-switches, when either one or the other of said push-buttons 316, 317 is actuated by the user. Accordingly, the actuation of the micro-switch 325 will therefore cause an electromagnetic valve (not shown) to open, thereby enabling the steam to flow from the steam generator to the smoothing iron 301 via the first conduit 310.

The steam ironing apparatus according to the present invention further comprises containment means 321 adapted to hold a liquid L, such as for instance water, said containment means being connected, via a third conduit 322, with said second conduit 311 at a point situated close to the nozzle 318. The transfer of the liquid L from the containment means 321 along the third conduit 322 up to the connection thereof with said second conduit 311 is obtained, according to a preferred embodiment, by virtue of

the Venturi effect that is brought about by the pressure drop caused by the passage of steam through the same second conduit 311.

It should be noticed that the materials used to implement the present invention, as well as the shapes and the size of the individual component parts, may each time be selected so as to most appropriately fit any particular need or comply with any application-related requirement, without this implying any departure from the scope of the present invention.